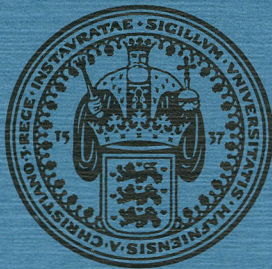


**The Fundamentals
of Perspective Text Analysis**

Bernhard Bierschenk

1993

No. 45



Copenhagen University
Denmark



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**KOGNITIONSVETENSKAPLIG
FORSKNING**

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Abstract

The major assumption made is that language as a natural system is both self-organising and self-referential. Compared to common syntactic-semantic approaches, the present approach is ecological and builds on the unambiguous identification of textual agents and agencies together with their objectives. Because information transaction cannot be studied without an emphasis on the text producer's text building behaviour, his intended and oriented schematising as unitizing activity has been focused upon. The main principles making up the foundation of Perspective Text Analysis (PTA) are presented in the form of 15 propositional statements. These are discussed with a stress on the involved dynamic formalism that creates co-operation and interaction between various (AaO) unities. This implies a stress on analysis and synthesis of the morphogenesis of conceptualizing processes. It follows that PTA traces the transformations involved in the aggregation of (dis)joint textual elements into systems. These may be characterised by particular geometric profiles specifying the boundary conditions of the language space in which the verbal flow patterns occur, containing the perspective and objective invariants of a particular configuration.

Human behaviour is dependent on a source or potential or cause which has been characterised by terms such as "energy", "spirit", "élan vital", "life", "intentionality", "intention to stay alive", "survival", "genetic code", "natural systems", and "synthesis". Probably the oldest of these terms is "energy" meaning vigour or power in action. This meaning is derived from the Greek words "en + ergon" which specifies the circumstance that someone or something is at work. All other terms are to be conceived of as variations in discipline or orientation. Common to all is the observation that all things become structured by it. In physics, hypotheses about various forms of energy have crystallised into a "Periodical system of energies" as proposed by Feekes (1976). Theoretically, the classical models of energy give expression to the view that analytical propositional (p(X))-knowledge is the result of an investment of physical and/or psychic energy generated by the individual regardless of the "ecological information flow", i.e. something reflecting the forms of dynamic processes in the organism-environment system (Gibson, 1979). Judging from the conventionally given descriptions, based on the power models of Feekes (1976, p 155), objects cannot be known with certainty because they are indeterminable and therefore, cannot be perceived directly. The basis for generating correct and generalizable pieces (p(X)) is the idealised or abstracted individual. In generating differentially fragments of knowledge, analysis is favoured over synthesis, because the intensity or power law involved, produces the desired normative (p(X))-structure on the basis of intensional-extensional logic. In general, intensity is the generic term which is conjugated with an extensive quantity. It is usually assumed that a production rate is mediated in terms of the number of (p(X)) and rate of production per time unit.

In contrast, knowing emerges from the co-operation and interaction of multiple agents. It is dependent on the conditions of *perspectivation* and the cognitive functions of natural language. Thereby it is assumed that the Agent-action-Objective (AaO) Schema is the axiomatic basis for the steering and control mechanism involved in the development of both behavioural and cognitive abilities.

Proposition 1 *Knowing rests entirely on the synthetic (AaO)-proposition by which an individual expression is schematised.*

The foundation for this provocative proposition for the study of knowing was formulated during the 18th century by Immanuel Kant (1975). In formulating his principles, he concentrated on the logical form of judgement and pure reason by which the unknown could be made known. Kant's main argument is that knowing is brought about by the Schema axiom whose theorems guide and control the process of synthesising. They constitute the basis for the proposed "linkage mechanism" (B. Bierschenk, 1991) that controls the expression of subtle movements of thought through natural language. Such a linkage mechanism has been constructed on the basis of the following general systems expression:

System Expression (AaO)_n, where (1)

$$\text{A-linkage} = A_n = \text{Text} / X / A_{n-1} / (A_{n-1} + O_{n-1})$$

$$\text{O-linkage} = O_n = \text{Text} / Y / (A_{n+1} + O_{n+1})$$

X: Variable, representing unknown agent

Y: Variable, representing unknown objective

In general, the expression discloses how a string of letters or part of a clause may become co-operative through a kinematic description involving the language system as linkage between mind and text building behaviour. The linkage mechanism illustrates how the evolving system guides and controls the rhythmic, that is the dynamic development and algorithmic functioning of language expressions. It characterises the functional, structural and dynamic aspects of a discourse.

Proposition 2 *The significance of the linkage mechanism in an intra-systemic analysis appears only in the Kantian schema as synthesis.*

To summarise, the Kantian approach makes fully use of a morphological perspective on information flows. Although "laws of information", as stipulated by Gibson (1979), may be novel, nevertheless, they can be approached through accepted topological procedures emphasising (1) distance, (2) singularity, and (3) invariants (Kugler & Turvey, 1987, p. 10).

To get this problem under methodological control, it becomes necessary to find a design solution to the question of what kind of information the observer perceives and to what extent perceived informational invariants can be extracted. Detecting these invariants implies the detection of morphological properties. The ability to give expression to this kind of invariants rests on the (AaO) formula expressing itself in the extraction of morphological properties. Primarily through cyclic and recurrent activities the Schema should be observable in interaction and development of limits. These limitations define expressed imagination as product of schematising processes and thus, as point of departure for information synthesis.

Due to Gibson (1979) it can be stated that interaction at the ecological level is informational and not "forceful" (Kugler & Turvey, 1978, p. 64). A person interacting with his fellows need to know what it is that is of significance to others. But this knowledge is dependent on the conditions of perspectivation. To know something about reality requires the introduction of some diagnostic materials or the design of an experiment that contains the "knowable" (B. Bierschenk, 1984). *Knowability* is the foundation of inquiry into peoples possibility to exert perspective control over their existence and to acquire a comprehensive overview. Because peoples' perspective is in the *verbal flow*, it is only a thermodynamic "flow" analysis and its description that can be taken as hallmark of systemic inquiry into peoples' text building behaviour. By this is meant that a person can give verbal expression to perceived ecological conditions as an ongoing process of making experience or to give expression to already made experiences. With this reasoning in mind, the following proposition can be stated:

Proposition 3 *Con-sciousness (=knowing together) is a function of shapeless, formless and transcendent mental invariants plus a patterned context, embedding constraining invariants.*

Theoretically, this proposition gives expression to the view that consciousness is the result of a covariation and interaction of macroscopic kinematic terms. It is assumed that a description of proposition 3 is law based. As Kugler & Turvey (1987, p. 424) observed: "... wherever geometries are coupled to conservation, laws arise." In general, the first part of proposition 3 does not cause the action of an agent nor does the second part completely constrain it. Functionally, the conjugation of both parts may be seen as the constituents of verbal flow morphologies. Previous research (B. Bierschenk, 1991) makes clear that the experimental subject develops a unique ability of using this kind of higher-order functions effectively and that this ability achieves its highest form of expression in natural language behaviour.

Text Building Behaviour

Inherent in the process of text building is the process of cognitive integration of experience. The ability to give expression to integrated experience covaries with the text building behaviour of the agent as reflected in natural language expressions. This implies that the nature of a text consists of appropriately selected ecological objectives put into words. But its sternness and ethical devotion can be processed only if the produced text consists of a number of qualitative distinct phases that are explicit and thus, communicable. Phase construction comes to an end with the emergence of a full stop marking end of text.

Proposition 4 *The agent's text building behaviour is constraint by mental and contextual invariants contained in verbal flows.*

This proposition builds on the assumption that verbal material, used for description, is arranged systematically in order to carry ecological and perspective invariants.

The proposition stresses the important fact that perceiving, acting and knowing have to be conceived within the context of joint operations within an ecologically determined system rather than as the activity of isolated agents. As a result, what is knowable of the world one lives in, should be studied on the basis of a co-operative act, which defines consciousness as synthesis of active inquiring agents. In this synthesis, it has been found that language provides the logical and most fundamental basis (I. Bierschenk, 1992 b).

Apparently the text building behaviour of an agent has to be viewed as a *transformational* writing-reading-rewriting process. Internal energy generating forces drive this process towards the layout of strings of graphemes and pattern of strings. These patterns may be regarded as texture like checker-squares with clearly marked borders. Patterned strings are purposely arranged this way as medium for carrying the informational invariants. As a first measure, the patterns have to be delimited and described (I. Bierschenk, 1992 a). By identifying their geometrical (spatial) properties and kinematic (space/time) arrangement, they can be fashioned in arrays. In the course of text production continuous successions of demarcations of borders are characterising the language system as self-organising and thus as unbound. The result is a system that is open to verbal flows. These become structured by clause and sentence markers which are identifiable on the basis of a very small dictionary containing the graphemes, strings and patterns of strings to be matched up with running text.

The Agent as Scale Factor

What is central to consciousness is indicated by Immanuel Kant's observation in "Anthropology" that a human being can have the idea of an "I" which can transform the human being into an autonomous and responsible agent. From the Kantian point of view, this means the study of *intentional behaviour*. Intentional behaviour is teleonomic in nature and aimed at: (1) transforming the environment, (2) preserving experience, and (3) increasing the individual's competence for structuring its environment. Ecological perception emphasises information transaction through co-operation between a knower and a knowable environment. A description of perceived situations of significance means approaching consciousness in the Kantian sense *par excellence*.

The goal is an *affinity* analysis that ensures both the formal or representational and the referential functions of the mind, usually referred to as comparison between the modeltypic and the prototypic. By contrasting the modeltypic with the prototypic (B. Bierschenk, 1990), quality or depth can be stated formally. This approach excludes the occurrence of anything that is unknown. The unknown can easily be interpreted as the ambiguous, unrepresented, or unnamed. In Kantian terms, the construction of representational environments means a narration of the problems of coordination, competition and co-operation at all levels of organisation. Its function is to relate "survival" to possible consciousness. To speak with Kant, these forms are "concrete", because they are fully synthetic and thus complete and particular. From a methodological point of view the representational forms are the concepts of scientific reasoning about the world. As such these concepts yield no occasion for discursive speculations about the state of the world. Once the world is recognised by these concepts, the foundation is laid for a discourse on the nature of reality and that of "order" (Bohm, 1983). But the terms of a system cannot be synthesised without the active inquiring agent. Therefore, the procedure for generating the system for an ecological description is *agent-governed*.

Proposition 5 *In text building the agent determines what kind of objectives are chosen and how they change throughout the process of text production.*

The proposition (5) implies that the agent as observer of itself is the text producer. There is no statement on anything but a description of processes, objects and events. The basic assumption behind the proposition (5) is that text only can be analysed with reference to somebody being its source. This means that there must be a person, who intentionally is speaking or writing text, some perspective by which it is produced and a mechanism that transports linguistic form and organisation into structural information. What kind of information can be picked up from the objectives depends on the perspective chosen. It cannot be inferred from public statements or from the surface features of text, because it is parasitic on the sequences of events that bind the perceiver to the perceived or the knower to the knowable. Ultimately, only sequences of events involving the objectives can carry the structures to be reflected through language.

The Operative Space

Only under the condition of a language that can create an *operative space* within which the empirical agent can narrate alternative acts and consequences (Jaynes, 1978, pp. 59-64), the basis for co-operation between physical and mental constraints can be studied in a meaningful way. This space is functional not geometrical, because everything is localised according to ecological principles. In this space *intention* and *orientation* produce irreversible processes that are real and play a fundamental role in the development of the progressive organisation of the language space. Text building behaviour is deeply rooted in movement (I. Bierschenk, 1992 b) and arises out of kinematic interactions in which every verbal event proceeds at a particular moment in a certain region of the language space that make it possible for the production process to be co-ordinated as a whole. Unfolding the configurational architecture of natural language requires a procedure that has the capacity of processing its implicit syntactic relations.

Intention. Cooperatively and interactively working textual agents comprise a functional coupling which manifests itself by a *helix*. The helix carrying the intentions of the text producer is marked by various agents and agencies. The process of introducing different agents or transferring agents from one segment to another implies a dissipation of concentrated energy. Unfolding this helix shows at which points in time new agents are introduced and how they shift throughout text production. Thus the agents embedded in the system expression (1) give rise to a cyclic development of natural expression into a hierarchic order. The following proposition captures the phenomenon of intentionality underlying the texture of a text.

Proposition 6 *Self-referential and cyclic processes govern the verbal flow.*

The steering function of the agents is achieved by an unambiguous identification of the textual agents and their dependency relations. This function produces twisting and twining. Twining marks a folding of the curve, where a new agent variable is introduced. Twisting of the helix around its own axis is instantiated by the existence of a substantial agent string or the formal indicator for intention. Visualising the verbal flow as governed by textual dynamics and linkages would require a moving point, whose function is to indicate the translational and transformational properties in the formation of a "dissipative structure". Prigogine (1980, p. 104) writes: "Once a dissipative structure is formed, the homogeneity of time as well as space may be destroyed."

Orientation. A complementary helix is formed by the orientation of the text producer and consequently associated with his objectives. The process of transferring the objectives initiates a phase-dependent coupling. Unfolding this coupling shows how the language system makes use of a mechanism that controls the oscillation of the constitutive A- and O-

components. Constraining and breaking of constraints portray the structural coordination of the A's and O's and prescribe the process of assembling the objectives on the basis of the agent function. In the course of writing, the text producer continually contributes with new agent and objective couplings whose orientation is toward an increasing configurational order. Thus the verbal flow contains diffused objectives. But the process of writing and rewriting constrains the diffusion over the flow by patterning the flow itself. The relational order of the objectives is signalled by another closed system functioning as pointers toward ecologically determined objects and events. A small dictionary of pointers (the prepositions) relating objects and events are used in identifying the objectives of produced text. The linguistic pointers to the objectives operate according to the following general scheme:

<i>Pointers</i>	<i>Component</i>	(2)
Absent preposition	Figure	
in, over, towards	Ground	
with	Means	
for	Goal	

When prepositions of the same type appear, their position relative to one another determines which of the components is present. This process integrates a set of interrelations among the components. Neither for material nor for textual texture exists any proper and perfect unit in terms of which texture can be analysed. The texture of a text constitutes the relatively fine surface structure providing for a wealth of transitions and overlaps.

Viewpoints. The "view-points" of a text constitute the natural units which are nested within larger units. Their great number and the relatively short intervals with which the viewpoints are deposited throughout a text define their gradient. The viewpoints carry the properties of the *Figure* component of a text.

Standpoints. Certain viewpoints are coupled to attractants drawing or relating the viewpoints to reality. By means of this relational property, the observer defines both his "stand-point" and the relational scope of his observations. The curvature describing the standpoints is characterised by a different kind of intervals compared to the curvature of the viewpoints. They are longer and the distance between deposited standpoints is greater. This makes them independent of being classified as properties of the *Figure* component. The observer's sensitivity to an adequate spacing determines the degree to which his viewpoints are tied to reality and thus, define the *Ground* component. In this perspective, viewpoints and standpoints are characterised by a mutual curvature of neighbouring deposits but exists as independent offer, free from values and emotions. Too widely diffused would mean the absence of a demonstrable path. Thus, there is a limit, that parse text into text that is coupled to reality and text that is not.

Aidpoints. A conceptualized method, course of action or an instrument by which some ends can be achieved or an action supported is indicated by "aid-points". Aidpoints are defined on the basis of the Latin expression "adjutare" which means to give help. It is another relational property and signifies optional resource use. Aidpoints are distributed over a gradient that defines the *Means* component.

Setpoints. Goal guidedness is influenced by the intentions in the text building behaviour as well as by the environment which constrains it. As a result, intended ultimate behavioural outcomes are distributed as "set-points" over a gradient that defines the *Goal* component.

Proposition 7 *Different and intertwined trajectories reflect the dynamics of the verbal flow.*

Directedness. Ecological information carried by these trajectories cannot be studied without reference to directed activity which has to be regarded as intentional. Standard

grammatical description associates intentionality with the verbs of a language. The verb function is associated with the structural aspect necessary for a forceful description of syntactic properties pertaining to co-ordinated clauses. Based on a dictionary of verb stems together with prefixes and suffixes the structural aspects pertaining to the mechanics of language are identified. The variability of the strings of graphemes in a sequence implies that the units of the verb function should not be treated as unit functions themselves (Ghiselin, 1981, p. 200).

Proposition 8 *The nucleus function that the verb fulfils is to preserve the directedness in the process of perspectivation.*

This proposition is the common basis for capturing the structure supporting a text. This basis should not be confused with the texture of the text itself. From the agent's point of view, it is unimportant to know what a particular word "means", because perspectivation is different from consensually derived knowledge as reflected by some authority in the form of a person, text or institution. What counts for Kantian "reason for realism" is that words have the function of being medium between experience and cognition.

The central properties of the transport mechanism can now be summarised in the form of the AaO machine. This AaO machine has been converted into a package of computer programmes (Helmersson, 1992) that makes possible the discovery of structural information that is independent of the AaO machine itself. With respect to the complementary role of the A- and O-component the following basic activities are carried out:

- (1) governed by openers, an iterative procedure interchanges strings of graphemes.
- (2) dummies for agents (A) and objectives (O) are substituted with strings.
- (3) the dummies for agents are processed by a forward or downward swing.
- (4) the dummies for objectives are processed by a backward or upward swing.
- (5) pendular down- and upward swings perform according to "limit cycles".
- (6) the "limit cycle" mode controls the discontinuities and changes in the verbal flow.
- (7) clock-like cyclic and recursive algorithmic procedures establish a dynamic regime

A natural language system interacts through the properties of its components and exists in the operative space that these components specify. But it is the flow of energy, governed by internal processes, that give rise to its structure.

The Flow of Energy

In physics, hypotheses about various forms of energy have crystallised into a "periodical system of energies" as proposed by Feekes (1976). His model of presentation shall be utilised with the purpose of studying text building at the Volume-Elasticity level. In his hierarchy of expressed forms of energy, the basic components for the calculation of energy are given as persistence (p), extension (e) and time (t). From these components Feekes (1976, pp. 155-156) derives the dimensional relations for Volume-Elasticity. The generalised basic model component (t) is the component that specifies an interval separating two points on a non-spatial continuum in which events occur in apparently irreversible succession, and (e) is the component that marks the extension, displacement or locomotion and other rhythmic movements away from a certain state.

The relational quantities presented in the following constitute a measure of a particular style of text building. The physical principles that fashion the translational states of text as a system requires the following:

- (1) A body composed of graphemes and spaces in and between strings of graphemes. These constitute the Mass of an identified body of language. The quantities of visible elements and

separating spaces make up the total mass which constitutes a unified body of language with no specific shape.

(2) When the variables of all three constitutive components of the (AaO) formula are identified and assigned their value, Block (1, 2, 3 ... n) is manifested. A block determines the unit of extension. In general terms, extent is operationalized with Length of trajectory.

(3) The time interval between two successive occurrences of points is called a natural period of the cycloidal arc. The full pause at the end of a spoken sentence or the sentence markers (. ! ?) at the end of any statement thought to be complete, are taken as indicators of unit time. A period is characterised by the establishment of one or more blocks. The number of counted blocks per period gives a quantitative measure of the rate at which kinetic energy produces a verbal flow in a particular language system. Moreover, mass may be related to the produced blocks per period.

Choosing the linear dimension (L) makes the relational dimensionality of the AaO unities obvious. This dimension will increase in power as text grows. Successive larger values of measurements on text volume and text surface (texture) will show that the growth rates of volume and texture are not identical. Volume grows more rapidly with increase in the linear dimension than does text surface. The three-dimensionality of the relational interactions of the AaO unities in the kinetic couplings can be visualised as three lines (3L!) going in different directions. The common expression is $V \rightarrow L^3$. The greatest section of texture will always be two-dimensional implying the coupling of an (A) with an (O). The common expression for texture is $T \rightarrow L^2$. Of the forces determining the form of text, some will be in proportion to texture and others will be in balance with volume. Clearly, the concept of Volume-Elasticity (L2, L3) is related to the observation that regular distortions in the form of text alters so that texture keeps pace with its body.

A kinetic description of energy flows (= verbal flows) rests fundamentally on a few basic assumptions about these components and the conserved quantities. For example, it is assumed that a mass-based description provides needed connections among the different levels of a system that is composed out of primitives. When the component with the inertance (I) to persist in a certain state is multiplied by flow (v), this will give as a result the momentum (M) of a system. Momentum is the derived quantity that marks the potential of activity of a system. Moreover, it is assumed that the energy flow model correctly reflects the macroscopic features of the language body through the relations existing between the quantities related to the basic components and the quantities related to the derived components.

Using the conserved quantities related to the I-factor and the v-factor implies that the kinetic energy invested into a text can be observed as macroscopic motion. Momentum as predictor of the system's slowness or defensiveness and Force (F) as response variable or potential of overcoming the system's tensile strength will be used for predicting microscopic dissipative properties. Precisely how the derivatives relate to the thesis of "Elasticity" depends on the degree of conceptual differentiation which involves the time dimension.

The Flow of Information

Conventionally, the relations existing in language are measured as to their attributes. Thereby, they are divided into quantitative and qualitative ones for the purpose of measurement and statistical analysis. Measurement refers to the subject's ability of judging whether and to what extent some stimulus (X) has the subjective quality (Y). Measuring can therefore be thought of as the researcher's ability of qualifying analytical propositions ($p(X, Y)$). The main requirement in this judgmental approach is that the observer's *internal frame of reference* can be controlled such that other researchers can duplicate the building of

constructs. Analytical propositions represent the physical world in terms of its mental or psychological value within determinable limits of error. The relative weight of expressed relations is given by their physical values, whose combination is the foundation of psychophysical scaling, which is based on their locally conditioned spacing, leading to "knowledge structures" built on analytical propositions

Timing and Spacing of Textual Elements

When measurement incorporates the globally conditioned timing of attributes, it becomes bound to the measurement and representation of the dynamics of natural systems. This kind of systems is characterised by cycles as well as fine grained oscillatory changes in the behaviour space and can be investigated by a course of action that:

- (1) compiles textual elements into uniquely patterned strings of graphemes.
- (2) defines every uniquely patterned string as a quantity of its own.
- (3) pools any initially defined quantity (W/n), where W is the within-group variance and n the partitioning.

This technique locates and makes use of discontinuities. It proceeds by partitioning n -observations of uniquely patterned strings into g groups. Each g , consisting of one and only one pattern, has an ESS value of zero, because the quantity within any of these groups is zero. Those two groups become agglomerated, whose merging gives the least possible increase in quantity. The process of combining is repeated for $(g - 1)$ groups until all $(g - 1)$ boundaries are removed. Every particular matrix gives the coordinations with respect to the agent's distances to the respective objectives (2). On the basis of the distance matrices set up, a maximising objective function, expressed as a minimum increase in the Error Sum of Squares (ESS) may be computed. The values refer to Ward's (1963) method, whose purpose is to indicate minimal loss of information. The values of the ESS coefficients have a distribution which is used to identify the behaviour of the language system. Local conditions may operate in the assemblance of individual patterns of strings making spacing different from timing. Agglomerating the surface features into groupings means that natural groups are identified, whose content is easily scrutinised by the process of assigning a meaningful name to the identified groupings.

Proposition 9 *The break-points for merging and branching are characterised by time-dependent and periodic oscillatory processes*

This approach has the mathematical convenience of providing a rational zero, namely the dissimilarity of two identical strings of graphemes. Because of the dimensionless nature of the used measure of distance, it is directly associated with space and the definition of the states of the system as described by their analytical concepts. Their names are determined on the *internal frame of reference* made up by words and symbols constituting the clusters. The prototypical naming of the clusters lays the foundation for naming the states of the systems. Thus crystallising a system of variables is synonymous with identifying its dynamical states.

Succession of states points toward some differences in the dynamics of the kinetics of a text. If indicated differences in "text mass" and "text length" have established scale differences, this would mark dissimilarity in complexity and variety of the measured points. This feature of additive dissimilarity of patterns of strings up to a point, eliminates the limitations of a frequency distribution. Due to conditionally periodic oscillations these patterns are hybrid. The degree of dissimilarity can be investigated on an overall measure of significance, because affinity and structural configuration have a common basis. But critical theoretical knowledge is

required, if this basis shall contribute valuable qualitative properties to the measurement of consciousness.

Alternative procedures for a decision on the agglomeration of hybrid and diverse strings and patterns of strings into natural and homogeneous groupings may be followed. The conditional assumption is that a break in the patterns of kinetic motion points toward a critical ESS-value at which an established tree-configuration should be truncated. Clustering means that a minimally sufficient number of convergent groups can be determined on the averaged data set. Logically, this independence between the variables and their manifold of interpretations constrains their scientific power. But more important is that two variables approaching orthogonality become orthogonal at their common singularity. Transition through these strict partially ordered "variable states" generates periodic disturbances, i. e. a unique "resonance" curve or a "trend" marked by a sharp "peak" or "drop", i. e. a singularity. A system that responds selectively to periodic influences rather than by accurate repetition allows for the abstraction of higher-order variables, that substitute the "original" source and represent it topologically. Based on the distance matrices, their organisations give an expression of closeness of textual elements both in space and time.

Proposition 10 *All A-clusters have to be presented as contiguous on the O-clusters before the invariants underlying the verbal flows can be mediated by the rhythmic and algorithmic functioning of the (AaO) formalism.*

Marginal cases may lead to non-comparable cluster dependencies. This is the case, when A-clusters are not comparable over O-clusters. Because of the asymmetrical and transitive nature of the order that relates A-clusters to O-clusters, specific connectivity matrices help identify precisely the dynamics and the strict order of the states. By inspecting the connectivity matrices it is possible to stipulate precisely the criteria and restrict the way the A-clusters relate to the O-clusters. This is a decisive step and has to be taken, because the results of the clustering are not directly dependent on the kinetics of the texts, i. e. on the data matrices.

By extracting and abstracting information from a cluster of elements, where membership is judged with reference to decreasing or increasing distance to a prototype, the indexed mode of organisation can be named. The prototypical naming of a cluster abstracts experience and imagination from the patterns of strings agglomerated within the respective grouping. In general terms, sustained displacement of patterns of strings is in itself a result of reversible thermodynamic processes, but they are irreversible and invariant over frequency variations.

The Behaviour Space of the Language System

Concentration of the objectives is to be achieved on the basis of statistical mechanics, but instability marks their trajectories. For example, different regions of concentration can be discerned. From an abstractive point of view it is the result of a numerical analysis of *distance* measures. The regions of higher concentration have a higher number of viewpoints than are included in the region of lower concentration. A physical connection of these regions is achieved on the basis of the textual agents, who relate to potentials. Quantitative changes in the potentials can be introduced through the number of agents participating in the conglomerative procedure or by critical changes in the dependency relations between agents and objectives. The concentration of the viewpoints is causally linked to the clusters describing the states of the system.

Proposition 11 *If a structured configuration can be observed and named or if a name exists that points toward a structure this implies that an articulated non-linear behavioural component can be extracted.*

In correspondence to proposition (11), it can be argued that the thermodynamic factor driving the verbal flow toward global stability defines the behaviour of the system. Therefore, this factor has been labelled the B-factor of the system (B. Bierschenk, 1991, p. 30). If the B-factor determines global stability it must be that statistical mechanics exhibit local instability (Prigogine, 1980, p. 103; Kugler & Turvey, 1987, p. 53). Through the interplay of local and global (in)stability in the behaviour space, some phase transition can be observed. It lays the foundation for an irreversible flow from the initial state to the final state. The variables required in describing the non-equilibrium states of the system may be larger than the number of equilibrium states. Thermodynamic stability (according to the 2nd law) is defined by depicting the irreversibility of the "Source-to-Sink" connections.

Proposition 12 *A decision on the minimally sufficient number of states implies a decision on the number of variables describing the states of the system.*

In the identification of configurational order the ESS-values are used. These values are metric and based on distances. Kugler & Turvey (1987, p. 16) state: "Distance is a scalar that is a magnitude that transcends systems of co-ordinates." A decision on the minimally sufficient number of states implies a decision on the number of natural groupings or clusters. Any internal criterion has to be based on mathematical assumptions that vary in relation to the criterion chosen. The criterion focused upon is either the critical ESS-value $= > 1.00$ or the significance criterion ($P(t < T)$) for the t-test. Levels of significance may be chosen with respect to a step-by-step clustering or based on the total configuration at a certain moment in a cyclic process. Alternatively, one can choose to rely on an obvious break in the configuration or base his decision on both. By relating a final state to an initial state evolving in the neighbourhood of each other the needed transport processes are produced. These give rise to a course or path containing the points of attraction.

Proposition 13 *The singularities of a system are to be characterised by a configuration of termini.*

Any particular singularity marks a macroscopic and thus, a qualitative distinct mode of organisation. The result is a course defined by attractant states that create synthetic concepts, that is *terms*. In contrast to the analytical concepts with their intentional contents and exceptional constraints, terms are not to be conceived of as integration but as the result of transformations. The terms are the fundamental limits for the development of meaning incorporating directedness. As terms come into existence, more or less uncoordinated states become co-ordinated and formed into a path. A co-ordinated state of a system is an expression of the egomotion shifting into ego-orientation to be conceived of as "cognitive loco-motion". By naming its singularities meaning is assigned to limits and the limits give as a result a configuration of terms. Logically, its production is independent of conserved energy and must result in "emergent novelty" (Rosen, 1978, pp. 90-93). From a Kantian point of view, it would be a mistake to equate emergent novelties with "symbols". Naming the novelties results in novel terms that are systems specific.

Figuration of Emergent Terms

The basic argument is that the process of intended and oriented schematization is directly built into the perception of people and their involvement. From the perspective of the person, perception has as its integrated part a behavioural loop in which the perceiver notes what other people respect or find noteworthy. This perceptual activity of assembling patterns of rhythmic movement defines the quality in the perceptual path taken by the perceiver. Its

phase sequences and assemblies of phase sequences are from a formal logical point of view the topologically defined invariances.

Proposition 14 *Topological invariance manifests itself in the points where bifurcation arise or where two relations cross each other.*

Every time when a bifurcation can be observed, it points toward some more or less significant discontinuity in the argumentation. It can be said that continuous changes in the independent parameters evoke these discontinuities. If the instantiated changes are small, they will produce a homorhetic path. Any time the transition from one state into another produce a sudden, unexpected or exceptional jump a new path comes into existence resulting in a hysteresis. The physical process of text building causing this kind of jump mediates informational invariants that, in a sense, are fundamentally different from the informational invariants described by the path before a hysteresis occurs.

In recognising the complexity of dependency relations in the three-dimensional architecture of the helical configuration, a discussion of textual transformations becomes meaningful first through an approach that approximates the relationships among the various parts of text as a unity in a plan, symbolising *a snake trying to bite its tail*. By maintaining topographical coherence between intention and orientation and its representation in the text, the nature of the transformed information stored in the snake's path changes as the snake progresses from one state to the next. Thus, the unity of a text becomes *self-indicative*.

Capturing the Snake with a Mesh

It is only within the Cartesian Mesh System where the quantities of text building behaviour remain constant. The spiral line followed by the Snake in its locomotory path is a transitory configurational pattern, formed of a line of growth. This line represents the lasting record of successive stages of form and magnitude. The growing path can be likened to a continuous forward-looking displacement of the Snake's head.

Proposition 15 *The auto-oscillatory working head of the Snake represents self-indication by "cognitive" locomotion or displacements.*

Caused by the influence of intention and orientation, the head is rhythmically and pendular raised and lowered as indicated by the emergence of new point attractants.

An elementary application of a *minimally sufficient mesh* may be done with the purpose of comparing the *dimensionality* of the behaviour space of one Snake with that of another one. Thereby, self-indication can be made the basis for a formalisation of "self-reference". Moreover, because the Snake is an indivisible unity, its completeness gives expression to consciousness as conservational invariance under transformation.

Intentionality in the Course of Action

It is characteristic of the evolved terminal states that the dynamic formalism of the (AaO) paradigm has created co-operation and interaction between various (AaO) unities. This mode has to be contrasted with the commonly favoured elemental units of action and their organisation into stable hierarchies. The result is a course of action which differentiates out various terminal states from the set of data of which the states are part. The way in which these states are linked to each other may be different from one analysed system to the other. Each gives rise to a course which determines the dynamics of the original text. This is so, because, as a person, the originator of the text, has incorporated his perspective in his writing. The perspective gives the writing its teleonomic character pointing toward intentionality. This intentionality governs the dynamics of the process and patterns the contextual constraints

which various states enforce on his text building behaviour. With this orientation PTA has overcome the all too concrete way of viewing perception and conception of text as simple pattern generation and recognition. This abstraction twines together egomotion and the segregated terminal states. But detecting motion is from the Gibsonian point of view not very useful. To act intentionally, one needs to know what has moved or changed.

Perspective Transformation

The agent-objective dependency in the formalism stipulates that the co-operation between both has to create a particular mode of resource use, namely, the pendular clocking (limit cycle) mode (Winfrey, 1980), which forms the perspective on the objectives (2) of a particular text. As a result, the pattern of rhythmic movement, expressed through the asymmetrical relation between the (view-, stand-, aid- and set-) points of the text and the textual agents, generates agent clusters. These groupings display a seemingly paradoxical situation as Kugler and Turvey (1987, pp. 416-417) observed, namely:

"Traditionally it is held that if intentional contents are identical with physical states (say, states of the nervous system) then it cannot be the case that intentional contents are sustained by physical states or vice versa. The argument is that two things or two states X and Y, cannot be both identical *and* causally correlated (Smart, 1959). But given the equation of intentional content and nonholonomic constraints, there is no irregularity in the claim that intentional content can be realised in (read: identical with) and produced by (read: causally correlated with) physical processes (those of the nervous system) *provided that the realisation and production are phenomena at different descriptive levels.*"

In correspondence with this view it can be said that the intentional content of the agent groups is both identical with and caused by the agents of the groups, i. e. it is self-indicative and represented by the movements of the Snake. But in this paradox lies the orthodox. The unambiguous relation between a certain cluster of points realises (is identical with) a textual state and is sustained by this state. Being identical and produced by itself leads to the prototypical description of a certain agent cluster with the name of the causally correlated cluster of points. By employing the specific *pendular clocking mode* of text as a system, perspective invariants can be extracted.

Discussion

It may be worthwhile to mention that Sperry (1952) has discussed the untenable thesis of connectivity as foundation of an architecture of neural nets and as basis of consciousness. He also dismisses the neurophysiological view to conceive brain processes as a result of a theoretical and generalised concept of a "machine" that works with a "brain code" as emphasised by Grossberg (1980) and Cook (1986), for example. He has accentuated interactionism with the purpose of overcoming the dominating identity theories of mind and matter. Sperry (1969, p. 532) writes:

"Most investigators of central functions will violently resist any suggestion that the causal sequence of electro-physico-chemical events in the brain, /... / could in any way be influenced by conscious or mental forces."

Despite the fact that the connectivity principle (S-R connections) as well as the brain code postulate have been questioned, Simon (1981, p. 72) states that sensory input becomes organised on the basis of mathematical-logical propositions and that knowledge exists only and exclusively through what can be given propositional (p(X)) expression. Thus, "consciousness" is equated with representation and one-way causality between particular centra in a

hierarchically organised nervous system. These theories propose the existence of some accumulated reaction-specific energy in the organism. Moreover, it is postulated that a relation between internal inhibitory mechanisms and behavioural outcome exists. But Hebb (1961, pp. 37-51) observed:

"In the learning process, we do not have a one-to-one relation between progressive changes of behaviour and changes in the synapse". /... / Whether a given synaptic junction will be activated in such regions of divergent conduction cannot be determined by control of the stimulating environment, the experimental situation in which the learning is to be established."

The theories of information processing and interactionism, built on the concepts such as "energy", "storing" and "flow" as if they were well anchored in theory and generally understood. In the theories based on energy models they are made use of as self-evident denotators of operations whether machine or organism specific.

In contrast the results presented in the present monograph makes a distinction between the conceptual and phenomenological dimensions of information processing. The outcome is a different conception of information in that, it is founded on the Schema axiom which gave rise to the Gibsonian formulation of information which is *specificational*. Specification has been achieved through topological abstractions and topographical representations.

In returning to proposition 3, it can be concluded that the topological invariants (singularities) of a verbal flow seem to function as the constraints (mentally and contextually) of the text building behaviour. The established singularities make up the limits of the thermodynamic processes. This means that the macroscopic process determines the morphogenesis of text and that a study of its local and global stabilities allows for a reconstruction of the dynamics that generates it. PTA puts its stress on the morphogenesis of the conceptualizing process, that is on "the discontinuities" of the phenomenon "text". This gives an opportunity to study the individual text producer's successive transformations and the growth of conceptual limits. The growing of limits is encompassed in the transformational changes. They are the fundamental terms, and by definition transformational which is a necessity in the discovery of a particular structure. Identification of a structure means that the limits cannot be extended infinitely. The growing of a structure is to be conceived of as a preservation and implies a constraint both mentally and contextually on the dynamics. Once the structure has been determined and named, the growth itself has been named. Finding the structural and remodelling transformational invariants is to be equated with discovering a person's *consciousness* underlying the respective language system. Finally, it has been demonstrated that the discovered structures can be named and that the names make consciousness communicable.

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